**REMARKS:**

Claims 1-28 are in the case and presented for consideration.

Claims 1-10 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite. Claims 1-10 have been drafted to avoid the examiner's §112 rejection, and in no way to overcome the prior art.

Claims 1, 3, 4, 6, 8-12, 16, 18, and 24-28 were rejected pursuant to 35 U.S.C. §103 as made obvious by the disclosure of U.S. Patent 5,441,403 to Tanaka et al. taken alone. The remaining claims in the case were rejected as obvious from Tanaka '403 taken in combination with one of U.S. Patents 3,202,203 to Reed (claims 5, 7, 17, 19, 20), 4,453,913 to Gitman (claim 2), 5,360,171 to Yap (claims 13-15) and 6,036,476 to Mitani et al. (claims 21-23).

Independent claims 1 and 11 have been amended to more clearly recite the invention, and in no way to overcome the prior art.

Applicant respectfully requests reconsideration for the following reasons. Applicant submits that Tanaka '403 fails to teach several limitations recited in independent claims 1 and 11. Applicant recites in claim 1:

> entirely colliding a jet flow of said fuel with said air jet flow within a range of positions where said fuel jet flow has sufficient turbulent strength and at a position where oxygen density of said air jet flow becomes low; and rapidly mixing said fuel with said air jet flow with turbulences at collision.

First, Tanaka '403 fails to teach or suggest the claimed step of "entirely colliding a jet flow of said fuel with said air jet flow." Tanaka '403 teaches the technique of mixing fuel with air at a plurality of stages. In the first stage, the secondary fuel injected toward the combustion air is intercepted by the primary flame and shielded from the combustion air at collision. (See abstract; col. 10, lines 18-34). Thus, fuel jet flow and

air jet flow are not entirely collided as recited in claim 1. A second stage of combustion is effected by bringing the secondary fuel into contact with a portion of the combustion air penetrating through the primary flame. (See abstract; col. 10, lines 50-56). However, this occurs at a point after and downstream from the collision as part of the staged process. (See abstract; col. 10, lines 50-56). Also, only a portion of the combustion air is mixed with the secondary fuel downstream. Likewise, only an unburnt portion of the secondary fuel, not subject to combustion with the primary flame, is brought into contact with the portion of the air penetrating through the primary flame. (See col. 10, lines 50-54).

Second, Tanaka '403 fails to teach or suggest colliding a jet flow of fuel and air jet flow at a position where the oxygen density of an air flow jet becomes low. Tanaka '403 only teaches "the density of residual oxygen in the outer peripheral surfaces of primary flame B1, is extremely lowered, which generates an extremely-low-oxygen thin layer of combustion gas surrounding the primary flame B1..." [Emphasis added] (See col. 10, lines 40-44). Thus, Tanaka '403 only teaches a thin layer of residual oxygen whereas claim 1 recites that a jet flow of fuel is collided with an air jet flow at a "position where oxygen density of the air flow jet becomes low." The present invention aims at minimizing free oxygen as much as possible, and thus the residual thin layer of low oxygen in Tanaka '403 is of little use as compared to the low oxygen density of an air jet flow.

Third, Tanaka '403 fails to teach or suggest the claimed step of rapidly mixing fuel with an air jet flow at collision. As mentioned above, Tanaka '403 discloses a process in which the secondary fuel injected toward the combustion air is intercepted by the primary flame and shielded from the combustion air at collision. (See abstract; col.

10, lines 18-34). Thus, the combustion air and the secondary fuel are not rapidly mixed at collision due to the shielding. As already explained above, a second combustion is effected by bringing the secondary fuel to contact with a portion of the combustion air penetrating through the primary flame. (See abstract; col. 10, lines 50-56). However, this occurs at a point after and downstream from the collision as part of the staged process. (See abstract; col. 10, lines 50-56). Thus, the mixing does not occur at the collision as recited in claim 1. Also, only a portion of the combustion air is mixed with the secondary fuel downstream. Likewise, only an unburnt portion of the secondary fuel, not subject to combustion with the primary flame, is brought into contact with the portion of the air penetrating through the primary flame. (See col. 10, lines 50-54).

As for independent claim 11, Tanaka '403 fails to teach or suggest "injecting fuel into said furnace so as to cause a jet flow of said fuel to entirely collide with said air jet flow." In Tanaka '403, the secondary fuel injected toward the combustion air is intercepted by the primary flame and shielded from the combustion air at collision. Thus, the secondary fuel and combustion air in Tanaka '403 do not entirely collide. Although a portion of residual oxygen is mixed with the secondary fuel, this occurs after and downstream from the collision, as explained above with respect to claim 1.

Moreover, applicant reiterates that the present invention cannot be realized only by increasing a specific surface area of the combustion air flow. Additionally, it is necessary to cause the combustion air to collide with the fuel while the fuel has velocity energy which is necessary and sufficient for turbulent diffusion mixing where strong turbulences exist. In other words, in the present invention, it is necessary to bring gas in the furnace into the air jet flow by increasing the specific surface area of the combustion air flow when it is injected into the furnace. This results in sufficiently

lowering the oxygen density of the combustion air, while a turbulent diffusion flame is formed for rapidly mixing the fuel jet flow with the air jet flow within a range that the fuel has velocity energy necessary and sufficient for causing the turbulent diffusing mixing involving strong turbulences. This feature of the invention is not disclosed in any of the cited references. The Office failed to respond to this distinction in the present Office Action even though claim 1 was amended to include this feature in applicant's previous response.

Independent apparatus claim 11 includes a similar limitation. This limitation, and other features of the invention are believed to distinguish the claims of the present application from the cited references.

In addition, the Office has rejected claims 26-27 stating that, "to have selected specific sizes of the air throat, and specific ratios of the diameter of the air throat to the fuel jet flow axis is simply a matter of engineering design choice and is not given any patentable weight." Applicant respectfully disagrees with the Office's position on several grounds. Applicant directs the Office's attention to page 17, lines 22-25 and page 38, lines 18-24 of the specification, which explain that when the specific sizes and ratios of diameter are in the claimed range, the fuel jet flow and air jet flow are caused to collide so that the fuel has the velocity energy sufficient for turbulent diffusion and the oxygen density of the combustion air is lowered. Therefore, this is not simply a matter of engineering design choice. As the Office is no doubt aware, all limitations of a claim must be considered meaningful, and, "the PTO must consider all claim limitations when determining patentability of an invention over the prior art." *In re Lowry*, 32 USPQ2d 1031, 1034 (Fed. Cir. 1994).

Additionally, the Office has not given any reason for considering the limitations in

claims 26 and 27 to be a matter of engineering design choice. Nor has any reference been cited to support the contention. The Office's response appears to rely on personal knowledge, rather than a specific source. Therefore, applicant respectfully requests that the Office provide an affidavit supporting its contention pursuant to 37 C.F.R. §1.104(d)(2).

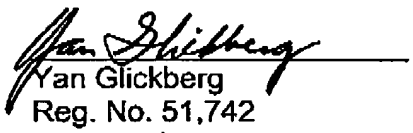
Claims 2-10 depend from claim 1 and claims 12-28 depend from claim 11, and thus, these dependent claims are allowable for the same reasons as stated above.

Accordingly, the application and claims are believed to be in condition for allowance, and favorable action is respectfully requested. No new matter has been added.

If any issues remain which may be resolved by telephonic communication, the Examiner is respectfully invited to contact the undersigned at the number below, if such will advance the application to allowance.

Favorable action is respectfully requested.

Respectfully submitted,



Yan Glickberg
Reg. No. 51,742
Attorney for Applicants
ph. (845) 359-7700

Dated: August 20, 2004

**NOTARO & MICHALOS P.C.**
100 Dutch Hill Road, Suite 110
Orangeburg, New York 10962-2100

**Customer No. 21706**